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TITLE: ABSORPTION REFRIGERATING MACHINE

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ABSTRACT:

PURPOSE: To shorten a starting time and prevent the crystallization of an absorbent liquid, regardless of the temperature of a generator, by a method wherein the opening on the side of both an absorber and a condenser of the ports of a three-way valve is gradually increased and the opening on the side of a bypass thereof is gradually decreased according as the temperature of the generator is raised during starting-up operation.

CONSTITUTION: A bypass 17b is connected to a cooling pipe 17 having a cooling water pipe 17a passing an absorber 5 and a condenser 3, through a three-way valve V1. During the starting-up operation of the title machine, the opening on the side of the cooling water pipe 17a of the ports of the three-way valve V1 is gradually increased and the opening on the side of the bypass 17b thereof is gradually decreased by a controller 8, on the basis of the temperature of an absorbent liquid in a high- temperature generator 1, which is detected by a thermal sensor T1. In this way, when the machine is restarted after its short stoppage and temperature of the generator is high, cooling water is quickly supplied, an absorbent liquid is prevented from being highly concentrated, and normal operation can be quickly done. When the machine is restarted after its long stoppage, heating efficiency is heightened and a time until normal operation is done is shortened since the enough supply of cooling water is delayed until the generator reaches a specified temperature.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the technique of improving the starting performance of
the absorption refrigerator equipped with the regenerator which makes a heat source especially exhaust
heat (for example, a steam and warm water) of other devices etc. in detail, about an absorption
refrigerator.
[0002]
[Description of the Prior Art] In order to raise the starting performance of an absorption refrigerator,
heating concentration of the lean solution is carried out for a short time, using the heat input at the time
of starting efficiently, to generate a refrigerant steam promptly is confirmed, and fixed time amount at
the time of starting, i.e., the method of stopping about 10 minutes and raising whenever [absorption
solution temperature] quickly, is common knowledge about water flow of cooling water.
[0003] For example, by-pass tubing is formed in cooling water tubing which constitutes an absorber in
JP,56-53240,Y through a cross valve, and the double effect absorption chiller of a configuration of
switching and controlling this cross valve by the controller which detects the refrigerant oil level of the
temperature of a thermogenesis machine, a pressure, or the evaporator lower part, and operates is
indicated.
[0004] however, the trouble referred to as being unable to shorten it conventionally [above-mentioned],
so that time amount until a lean solution will be in rich contracted state, and crystallize at the time of a
reboot or it starts stable operation in the reboot after conversely long shutdown expected equipment
when shutdown is very short since [which does not boil too much] the uniform approach referred to as
that only fixed time amount delays the water flow by the cooling water pump to starting of a refrigerator
is adopted **ed .
[0005] namely, as shown in drawing 7 , in the case of B1 which reboots for a short period of time after
shutdown Since the lean solution of a regenerator is the high temperature which it said was 80 degrees
C, supply of cooling water Fixed time amount, For example, when for 10 minutes is stopped, when the
temperature of 150 degrees C at the time of stable operation is exceeded far and cooling water is
supplied, whenever [absorption solution temperature] will amount also to 160 degrees C, and will be in
rich contracted state, and there is concern which results in the worst situation which said that a lean
solution crystallized in the meantime.
[0006] on the contrary, in the case of B-2 which resumes operation after a long halt Since whenever
[absorption solution temperature / of a regenerator] is falling even to the low temperature which it said
was 5 degrees C and the lean solution is still heated by 65 degrees C even if 10 minutes after starting
pass When supply of cooling water is started at this time, the temperature rise of a lean solution becomes
loose much more, and has the trouble referred to as that reaching the temperature of 150 degrees C
included in stable operation takes the long time amount for 20 more minutes or more.
[0007] Therefore, emphasis is put on avoiding crystallization of a lean solution in control of the system
in many cases, the water flow stop time of cooling water will be set up shorter, and it will operate on an

insurance side, and since the temperature rise of a regenerator takes longer time amount when a stop time is long, there is a problem referred to as being unable to aim at sufficient improvement of a starting performance.

[0008] Moreover, conventionally [above-mentioned], since equipment is a configuration which controls the cooling water supply to an absorber by only turning on / turning off a cross valve Since it cannot use for the rise of refrigerating capacity until the latent heat received when it was heated with a regenerator and a refrigerant evaporated is supplied to cooling water by the absorber, When refrigerating capacity does not increase, but has the fault which said that starting was overdue and the cross valve was switched, the flow rate of cooling water also had the trouble referred to as changing rapidly and changing refrigeration capacity sharply.

[0009]

[Problem(s) to be Solved by the Invention] Therefore, regenerator temperature is not [how] scrupulous, and this invention can shorten warm-up time, and it is going to offer the absorption refrigerator which a lean solution will be in overheating and does not crystallize.

[0010]

[Means for Solving the Problem] In the absorption refrigerator which is made in order that this invention may solve the technical problem of the above-mentioned conventional technique, and uses a steam or warm water for the heat source of a regenerator Connect to a cooling water duct the by-path pipe which bypasses an absorber and a condenser through a cross valve, and regenerator temperature with the controller which detects and operates It is the absorption refrigerator characterized by making the absorber of said cross valve, and condenser side opening increase gradually with the rise of regenerator temperature at the time of starting operation of an absorption refrigerator, and dwindling by-path pipe side opening, and is [0011]. In the absorption refrigerator which uses a steam or warm water for the heat source of a regenerator, it is the absorption refrigerator characterized by dwindling the absorber of said cross valve, and condenser side opening with the fall of regenerator temperature at the time of dilution operation of an absorption refrigerator, and making by-path pipe side opening increase gradually with the controller which connects to a cooling water duct the by-path pipe which bypasses an absorber and a condenser through a cross valve, detects regenerator temperature, and operates.

[0012]

[Function] In order that the absorber of a cross valve and condenser side opening may increase gradually with the rise of regenerator temperature at the time of starting operation and by-path pipe side opening may gradually decrease, when the regenerator temperature at the time of starting is low, supply of cooling water is controlled, heating of a lean solution is promoted, when the regenerator temperature at the time of starting is high, many cooling water is supplied and overheating of a lean solution is prevented.

[0013] In case operation is suspended, the absorber of a cross valve and condenser side opening gradually decrease with the fall of regenerator temperature, by-path pipe side opening increases gradually, and in order that the amount of the cooling water supplied to an absorber and a condenser may balance the fall of regenerator temperature and may decrease, there is no concern which causes the lack of dilution and fault dilution.

[0014]

[Example] In drawing 1 , the steam pipe 10 for heating the high temperature regenerator with which 1 was piped, and 2 A low-temperature regenerator, For a condenser and 4, as for an absorber and 6, an evaporator and 5 are [3 / an elevated-temperature heat exchanger and 7] low-temperature heat exchangers. Piping connection is made by the refrigerant circuit 13 where these have the refrigerant steam pipe 11, the refrigerant liquid tube 12, and the refrigerant pump P1, the dilute solution duct 14 which has the lean-solution pump P2, the middle liquid tube way 15, and the dark liquid tube way 16, a refrigerating cycle is constituted, and it is [0015]. By-path pipe 17b is connected to the cooling water duct 17 which has cooling water tubing 17a piped via the absorber 5 and the condenser 3 through a cross valve V1, and it is [0016]. In a high temperature regenerator 1 and a low-temperature regenerator 2, evaporation separation is carried out from dilute solution and middle liquid, respectively, and cold water

can be picked out now from the cold-water tubing 18 piped via the evaporator 4 by using the refrigerant liquid liquefied with the condenser 3.

[0017] And it is installed so that a temperature sensor T1 can detect the lean-solution (middle liquid) temperature of a high temperature regenerator 1, and it connects so that a controller 8 may control the opening of said cross valve V1 based on this detection temperature data. Moreover, it connects so that the heating control valve V2 installed in order to control the amount of the elevated-temperature steam supplied to the steam pipe 10 for heating can also be controlled by this controller 8.

[0018] In addition, it is also possible to consider as the configuration by which the temperature sensor T2 installed possible [detection] is replaced with a temperature sensor T1, it connects with a controller 8, and the lean-solution (middle liquid) temperature breathed out on the middle liquid tube way 15 from the high temperature regenerator 1 controls the opening of said cross valve V1. -

[0019] Moreover, temperature sensor T3 for cold-water temperature detection installed in evaporator 4 outlet side of the cold-water tubing 18 is connected to a controller 8. Based on the cold-water temperature which this temperature sensor T3 detects, the opening of the heating control valve V2 is controlled, and control of the amount of heating in a high temperature regenerator 1 is attained.

[0020] Drawing 2 is a block diagram for explaining the example of 1 configuration of a controller 8, and the cold-water temperature which whenever [absorption solution temperature / of the high temperature regenerator 1 which the temperature sensor T1 (or T2) detected], and, temperature sensor T3 detected is inputted into CPU82 through the input interface 81, here predetermined data processing is performed, and it has composition which the opening of a cross valve V1 and the heating control valve V2 can control through the output interface 83, respectively.

[0021] And ROM84 which memorized programs for control, such as control relational expression shown in the relation between whenever [absorption solution temperature / of the high temperature regenerator 1 which the temperature sensor T1 (or T2) detected], and cross valve V1 opening, for example, drawing 3 , RAM85 which stores temporarily the temperature which the temperature sensor T1 etc. detected, and CLOCK86 which sends a time signal for every predetermined time are connected to said CPU82.

[0022] Next, based on drawing 4 , the cooling water control at the time of starting operation, i.e., the example of control of a cross valve V1, is explained.

[0023] If a seizing signal is inputted at step S1, whenever [absorption solution temperature / of the high temperature regenerator 1 which the temperature sensor T1 detected at the following step S2] will be inputted.

[0024] If a start switch is supplied with the absorption refrigerator in a shutdown condition, the heating control valve V2 which was in the close condition will open by the command of a controller 8, the lean solution which a hot steam passes through the interior of a high temperature regenerator 1 through the steam pipe 10 for heating, and has it in the interior will be heated, and a temperature rise will start.

[0025] The control relational expression of whenever [absorption solution temperature / of the high temperature regenerator 1 which ROM84 has memorized at step S3], and a cross valve V1, for example, drawing 3 , is called, and it is [0026]. In step S4, it calculates and asks for the cooling water tubing 17a side opening of the cross valve V1 required in this case from the control relational expression of whenever [absorption solution temperature / which was called], and a cross valve V1, and is [0027]. Based on this result of an operation, the opening of a cross valve V1 is controlled in the following step S5.

[0028] At step S6, it judges whether the cooling water tubing 17a side opening of a cross valve V1 is 100%, if it is 100%, when ending control of the circulating water flow at the time of starting and having not become 100%, whenever [absorption solution temperature / of a high temperature regenerator 1] is again inputted after return and predetermined time before step S2, and opening control of a cross valve V1 is performed repeatedly.

[0029] for example, when whenever [absorption solution temperature / of the high temperature regenerator 1 inputted at step S2] is 65 degrees C or less step S3 -- call appearance, since it calculates that the cooling water tubing 17a side necessary opening of a cross valve V1 is 0% (the by-path pipe 17b

side necessary opening excludes this publication below 100%) in step S4 based on the control relational expression of drawing 3 the bottom In step S5, the cooling water tubing 17a side opening of a cross valve V1 is controlled to 0%.

[0030] Therefore, in the opening judging in the following step S6, it progresses to the NO side and returns before step S2.

[0031] Thus, since it does not increase, the circulating water flow which flows into an absorber 5 and condenser 3 side through cooling water tubing 17a in order for the cooling water tubing 17a side opening of a cross valve V1 not to increase, even if it performs opening control of a cross valve V1 from step S2 to step S6, when whenever [absorption solution temperature / of a high temperature regenerator 1] is 65 degrees C or less is [0032]. Since the lean solution (dilute solution) which breathes out from an absorber 5 to the dilute solution duct 14, and flows into a high temperature regenerator 1 is heated by the elevated-temperature steam which is not cooled and moreover flows the steam pipe 10 for heating with a high temperature regenerator 1, whenever [absorption solution temperature / of a high temperature . regenerator 1] goes up quickly.

[0033] It is [0034], when whenever [absorption solution temperature / of a high temperature regenerator 1] goes up, for example, it amounts to 68 degrees C, while CLOCK86 repeats control from step S2 to step S6 every 5 seconds based on the time signal sent to every predetermined time (for example, 0.1 seconds). Since the cooling water tubing 17a side necessary opening of the cross valve V1 at this time calculates that it is 10% in step S4 and the cooling water tubing 17a side opening of a cross valve V1 is controlled by the following step S5 to 10%, cooling water begins to be supplied to an absorber 5 and a condenser 3 through cooling water tubing 17a.

[0035] Also in this case, in the opening judging in the following step S6, since the cooling water tubing 17a side opening of a cross valve V1 is 10%, it progresses to the NO side and returns before step S2.

[0036] Similarly it is based on the time signal which CLOCK86 sends. Every [for example,] 5 seconds Carry out by repeating control from step S2 to step S6, and the cooling water tubing 17a side necessary opening of the cross valve V1 based on whenever [absorption solution temperature] is calculated by step S4 each time. The cooling water tubing 17a side opening is made to increase gradually like drawing 3 at step S5, and the amount of the cooling water poured to cooling water tubing 17a which goes via an absorber 5 and a condenser 3 is made to increase.

[0037] And if whenever [absorption solution temperature / of a high temperature regenerator 1] goes up, for example, it amounts to 95 degrees C or more while repeating control from step S2 to step S6 In order that the cooling water tubing 17a side necessary opening of a cross valve V1 may calculate with 100% in step S4, In order the cooling water tubing 17a side opening is controlled by step S5 to 100%, and all the cooling water of the cooling water duct 17 flows to the cooling water tubing 17a side, and to flow into an absorber 5 and a condenser 3 and not to flow at all to by-path pipe 17b, The ejection of the cold water cooled as the specification becomes possible from the cold-water tubing 18.

[0038] Thus, if the opening of a cross valve V1 is controlled, it is judged that the opening by the side of cooling water tubing 17a is 100% in the opening judging of the following step S6, it will progress to the near step S7 of YES, and supply control of the cooling water at the time of starting will be completed.

[0039] In the absorption refrigerator of this invention which controls the cooling water tubing 17a side opening of a cross valve V1 in proportion to whenever [absorption solution temperature / of a high temperature regenerator 1] as explained above In the case of A1 which reboots after carrying out a short-time halt, as shown in drawing 6 , since the lean solution of a high temperature regenerator 1 is the high temperature which it said was 80 degrees C The supply interruption time amount of cooling water is a small 2.5 part grade, since supply is started immediately after this, stable operation can be started in about 15 minutes, and moreover, since it is not overheated, a lean solution does not have the concern referred to as being in rich contracted state or crystallizing.

[0040] on the contrary, in the case of A2 which reboots after long shutdown Since whenever [absorption solution temperature / of a high temperature regenerator 1] is whenever [low-temperature / which it said was 5 degrees C] Since they does not let cooling water flow at once but is made to increase it gradually in connection with a temperature rise also after 10 minutes until it amounts to 65

degrees C of predetermined temperature completely suspend supply of cooling water, plans a prompt temperature rise and exceeds 65 degrees C, stable operation can be promptly started also in this case.

[0041] therefore, the interval of shutdown and starting -- merits and demerits -- even if it is any, prompt starting is possible, and a starting performance is improved notably.

[0042] And since it is the configuration by which the cooling water tubing 17a side opening of a cross valve V1 is proportionally controlled-like based on whenever [absorption solution temperature / of a high temperature regenerator 1], the range of fluctuation of the cold-water temperature taken out from the cold-water tubing 18 is small, and there is an advantage which said that there was little fluctuation of refrigeration capacity for this reason.

[0043] In addition, if a start switch is supplied and predetermined time, for example, 60 minutes, passes also when whenever [absorption solution temperature / of a high temperature regenerator 1] has not reached predetermined temperature ROM84 is made to memorize the control program which makes 100% the cooling water tubing 17a side opening of a cross valve V1. If this predetermined time passes, whenever [absorption solution temperature / of the high temperature regenerator 1 which a temperature sensor T1 etc. detects] cannot be [how] scrupulous, and it can also consider as the configuration which supplies cooling water to an absorber 5 and a condenser 3, and starts operation.

[0044] Next, the example of cooling water control at the time of dilution operation which results in shutdown is explained based on drawing 5 .

[0045] If a dilution operation signal is inputted at step S11, whenever [absorption solution temperature / of the high temperature regenerator 1 which the temperature sensor T1 detected at the following step S12] will be inputted.

[0046] If a safety switch is thrown in with the absorption refrigerator in operational status, the heating control valve V2 which was in the open condition will be closed by the command of a controller 8, heating in a high temperature regenerator 1 will be suspended, and the temperature fall of the lean solution in the interior will start.

[0047] The control relational expression of whenever [absorption solution temperature / of the high temperature regenerator 1 which ROM84 has memorized at step S13], and a cross valve V1, for example, drawing 3 , is called, and it is [0048]. In step S14, it calculates and asks for the cooling water tubing 17a side opening of the cross valve V1 required in this case from the control relational expression of whenever [absorption solution temperature / which was called], and a cross valve V1, and is [0049]. Based on this result of an operation, the opening of a cross valve V1 is controlled in the following step S15.

[0050] At step S16, it judges whether the cooling water tubing 17a side opening of a cross valve V1 is 0%, if it is 0%, when ending control of the circulating water flow at the time of dilution operation and having not become 0%, whenever [absorption solution temperature / of a high temperature regenerator 1] is again inputted after return and predetermined time before step S12, and opening control of a cross valve V1 is performed repeatedly.

[0051] the time of whenever [absorption solution temperature / of the high temperature regenerator 1 inputted at step S12] being 95 degrees C or more -- step S13 -- call appearance -- since the cooling water tubing 17a side necessary opening of a cross valve V1 calculates that it is 100% at step S14 based on the control relational expression of drawing 3 the bottom, in step S15, the cooling water tubing 17a side opening of a cross valve V1 is not changed, but 100% of opening is maintained.

[0052] Therefore, in the opening judging in the following step S16, it progresses to the NO side and returns before step S12.

[0053] Thus, since it does not decrease, the circulating water flow which flows into an absorber 5 and condenser 3 side through cooling water tubing 17a in order that the cooling water tubing 17a side opening of a cross valve V1 may not decrease, even if it performs opening control of a cross valve V1 from step S12 to step S16, when whenever [absorption solution temperature / of a high temperature regenerator 1] is 95 degrees C or more is [0054]. Since the temperature of the lean solution which breathes out from an absorber 5 to the dilute solution duct 14, and flows into a high temperature regenerator 1 falls quickly and the elevated-temperature steam has stopped flowing into a high

temperature regenerator 1 moreover, also whenever [absorption solution temperature / of a high temperature regenerator 1] falls promptly.

[0055] It is [0056], when whenever [absorption solution temperature / of a high temperature regenerator 1] falls, for example, it amounts to 92 degrees C, while CLOCK86 repeats control from step S12 to step S16 every 5 seconds based on the time signal sent to every predetermined time (for example, 0.1 seconds). Since it calculates that the cooling water tubing 17a side necessary opening of the cross valve V1 at the time of a step S14 smell lever is 90% and the cooling water tubing 17a side opening of a cross valve V1 is controlled by step S15 to 90%, the amount of the cooling water supplied to an absorber 5 and a condenser 3 through cooling water tubing 17a begins to decrease, and the temperature fall of the lean solution of a high temperature regenerator 1 becomes loose.

[0057] Also in this case, by the opening judging in step S16, since the cooling water tubing 17a side opening of a cross valve V1 is 90%, it progresses to the NO side, and it returns before step S12.

[0058] Similarly it is based on the time signal which CLOCK86 sends. Every [for example,] 5 seconds Carry out by repeating control from step S12 to step S16, and the cooling water tubing 17a side necessary opening of the cross valve V1 based on whenever [absorption solution temperature] is calculated at step S14 each time. The cooling water tubing 17a side opening is dwindled like drawing 3 at step S15, and the amount of the cooling water poured to cooling water tubing 17a which goes via an absorber 5 and a condenser 3 is decreased.

[0059] And while repeating control from step S12 to step S16, when whenever [absorption solution temperature / of a high temperature regenerator 1] falls, for example, it becomes 65 degrees C or less, in order that the cooling water tubing 17a side necessary opening of a cross valve V1 may calculate with 0%, the cooling water tubing 17a side opening is controlled by step S14 to 0% at step S15, and it is

[0060]. In order for all the cooling water of the cooling water duct 17 to flow to by-path pipe 17b and not to flow at all to the cooling water tubing 17a side piped by the absorber 5 and the condenser 3, the temperature fall of the lean solution which the temperature fall of the lean solution which breathes out from an absorber 5 to the dilute solution duct 14, and flows into a high temperature regenerator 1 becomes still smaller, therefore is in a high temperature regenerator 1 becomes still looser.

[0061] Thus, if the opening of a cross valve V1 is controlled, it is judged that the opening by the side of cooling water tubing 17a is 0% in the opening judging of the following step S16, it will progress to the near step S17 of YES, and supply control of the cooling water at the time of dilution operation will be completed.

[0062] As explained above, the by-path pipe 17b side opening of a cross valve V1 increases gradually with the temperature fall of the lean solution of a high temperature regenerator 1, the cooling water tubing 17a side opening piped by the absorber 5 and the condenser 3 gradually decreases, and in order that the amount of the cooling water supplied to an absorber 5 and a condenser 3 may balance the temperature fall of the lean solution in a high temperature regenerator 1 and may decrease, there is no concern which causes the lack of dilution and fault dilution.

[0063] In addition, since this invention is not limited to the above-mentioned example, the control relational expression of whenever [absorption solution temperature / of a high temperature regenerator 1], and the opening of a cross valve V1 can be changed suitably, and it is possible to also make different the control relational expression at the time of starting operation and the control relational expression at the time of dilution operation.

[0064]

[Effect of the Invention] In the absorption refrigerator with which this invention uses a steam or warm water for the heat source of a regenerator as explained above Connect to a cooling water duct the by-path pipe which bypasses an absorber and a condenser through a cross valve, and regenerator temperature with the controller which detects and operates The absorber of said cross valve and condenser side opening are made to increase gradually with the rise of regenerator temperature at the time of starting operation of an absorption refrigerator. Since by-path pipe side opening is dwindled, it reboots by short halt. Since regenerator temperature is whenever [low-temperature] when prompt operation is possible, it stops for a long time and it reboots, while cooling water is supplied early and

fault concentration is prevented, when regenerator temperature is high, Time amount until heating effectiveness is high since supply of cooling water is delayed until it reaches predetermined temperature, and it results in a start up is shortened. Moreover, since supply of cooling water increases gradually, there is also an advantage which said that fluctuation of refrigeration capacity was small. On the other hand, the absorber of said cross valve and condenser side opening are dwindled with the fall of regenerator temperature at the time of dilution operation of an absorption refrigerator, and in the absorption refrigerator which makes by-path pipe side opening increase gradually, since the cooling water of the amount corresponding to the fall of regenerator temperature is supplied to an absorber and a condenser, there is no concern which causes the lack of dilution and fault dilution.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

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CLAIMS

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·[Claim(s)]
[Claim 1] The absorption refrigerator characterized by making the absorber of said cross valve, and condenser side opening increase gradually with the rise of regenerator temperature at the time of starting operation of an absorption refrigerator, and dwindling by-path pipe side opening with the controller which connects to a cooling water duct the by-path pipe which bypasses an absorber and a condenser through a cross valve in the absorption refrigerator which uses a steam or warm water for the heat source of a regenerator, detects regenerator temperature, and operates.
[Claim 2] The absorption refrigerator characterized by dwindling the absorber of said cross valve, and condenser side opening with the fall of regenerator temperature at the time of dilution operation of an absorption refrigerator, and making by-path pipe side opening increase gradually with the controller which connects to a cooling water duct the by-path pipe which bypasses an absorber and a condenser through a cross valve in the absorption refrigerator which uses a steam or warm water for the heat source of a regenerator, detects regenerator temperature, and operates.

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[Translation done.]